

1-1.10-31

EE24BTECH11062 - Homa Harshitha Vuddanti

Question:

Find the direction cosines of the line passing through the two points $\begin{pmatrix} -2 \\ 4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$.

Solution:

Given two points, The direction vector is given as,

Variable	Description
A	point $(-2, 4, -5)$
B	point $(1, 2, 3)$
m	direction vector along AB

TABLE 0: Variables used

$$m = \mathbf{B} - \mathbf{A} \quad (0.1)$$

$$m = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} - \begin{pmatrix} -2 \\ 4 \\ -5 \end{pmatrix} \quad (0.2)$$

$$m = \begin{pmatrix} 3 \\ -2 \\ 8 \end{pmatrix} \quad (0.3)$$

Direction cosines are given by a unit vector in that direction-

$$\frac{AB}{\|AB\|} = \frac{m}{\|m\|} \quad (0.4)$$

$$\|m\| = \sqrt{m^T m} \quad (0.5)$$

$$\|m\| = \begin{pmatrix} 3 \\ -2 \\ 8 \end{pmatrix}^T \begin{pmatrix} 3 \\ -2 \\ 8 \end{pmatrix} \quad (0.6)$$

$$\|m\| = \sqrt{77} \quad (0.7)$$

From equations (0.4) and (0.7), direction cosines are-

$$\frac{1}{\sqrt{77}} \begin{pmatrix} 3 \\ -2 \\ 8 \end{pmatrix} = \begin{pmatrix} \frac{3}{\sqrt{77}} \\ \frac{-2}{\sqrt{77}} \\ \frac{8}{\sqrt{77}} \end{pmatrix} \quad (0.8)$$

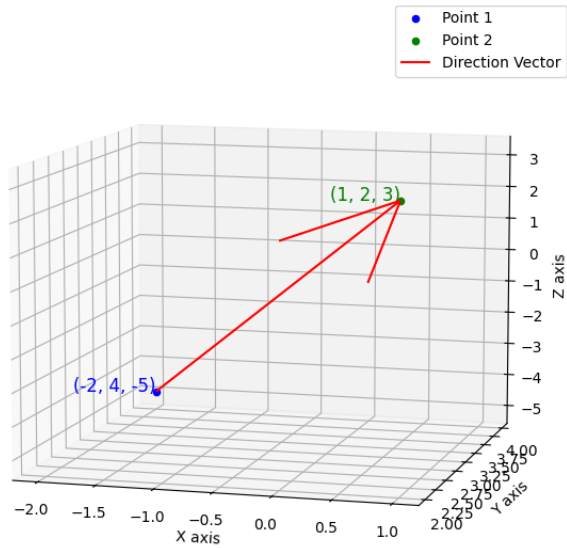


Fig. 0.1: Plot